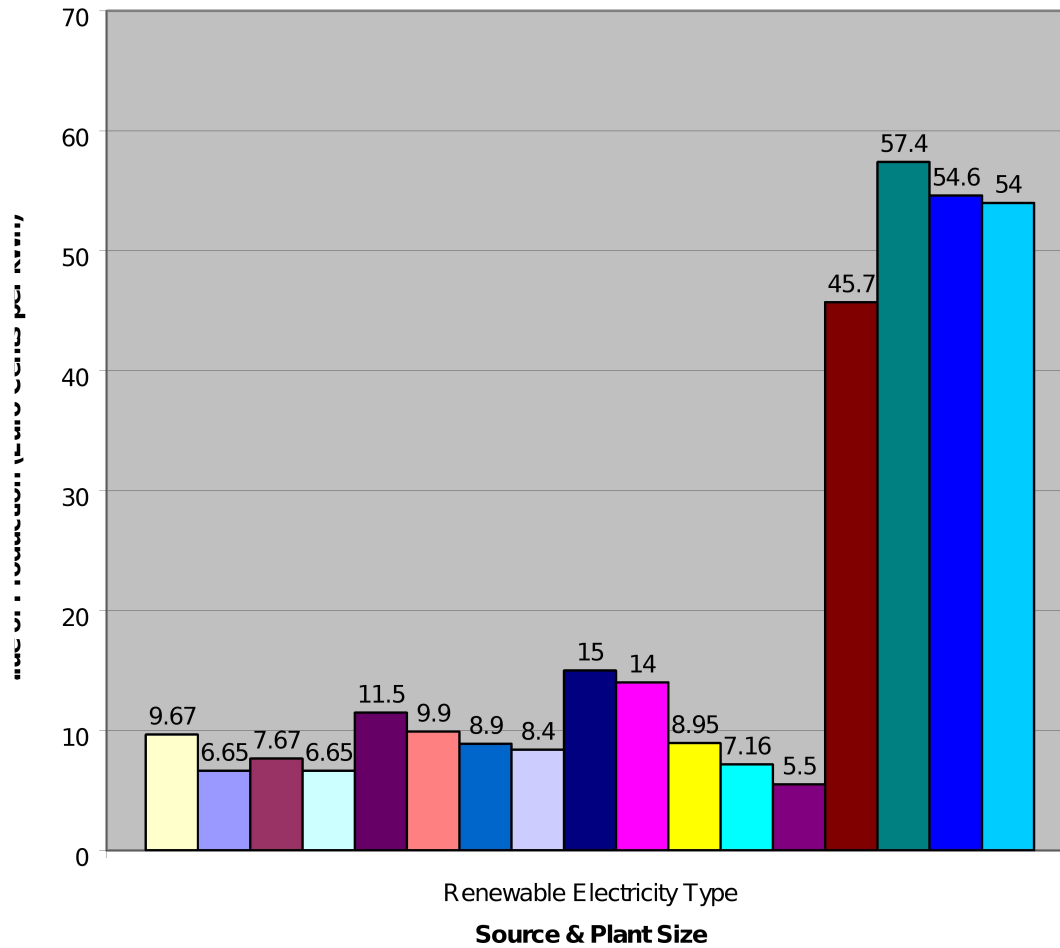


# BIPV Roofing Systems

What is the Value of  
Distributed Solar Electricity  
Generation?

- Solar electrons are worth much more than the Renewable Energy Certificates (RECs) imply
- There are better methodologies that could be utilized to value solar electrons
- One is the German law
- The other is a “two-way” number procurement solicitation

# Germany Act - J uly 2004 Basic Visual - Not exact



- Hydropower ( ≤ 500° kilowatts )
- Hydropower ( ≤ 5° megawatts )
- Landfill, sewage, mine gas ( ≤ 500° kilowatts )
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- Biomass ( ≤ 150° kilowatts )
- Biomass ( ≤ 500° kilowatts )
- Biomass ( ≤ 5° megawatts )
- Biomass ( >5° megawatts )
- Geothermal ( ≤ 5° megawatts )
- Geothermal ( ≤ 10° megawatts )
- Geothermal ( ≤ 20° megawatts )
- Geothermal ( >20° megawatts )
- Wind
- Ground-mounted Solar
- BIPV & Roof-mounted Solar ( ≤ 30° kilowatts )
- BIPV & Roof-mounted Solar ( 31 - 99° kilowatts )
- BIPV & Roof-mounted Solar ( ≥ 100° kilowatts )

# Discussion Points

- DOD's Big Footprint (400,000 buildings and vast roof area)
- Energy Efficiency, Insulation, ENERGY STAR® labeled low-slope roofing
- Solar Power (renewable energy, peak performer)
- Bi-functional, building-integrated photovoltaic roofing systems
  - » Proven roofing product
  - » Semi-proven flexible PV (amorphous silicon)
  - » Brand new integration of the two
- How does DOD buy/generate electricity?
  - » How much?
  - » How often?
  - » How much renewable?
  - » How much solar?
- **How much re-roofing does DOD undertake, annually?**
  - » At what cost (full freight, round trip)?
- Can we leverage full cost of annual re-roofing dollars (no additional cost) to re-roof same buildings with bi-functional, photovoltaic roof systems?
- UN-BUNDLE Solar From Other Forms of Renewables in BIG Power Purchase Solicitations

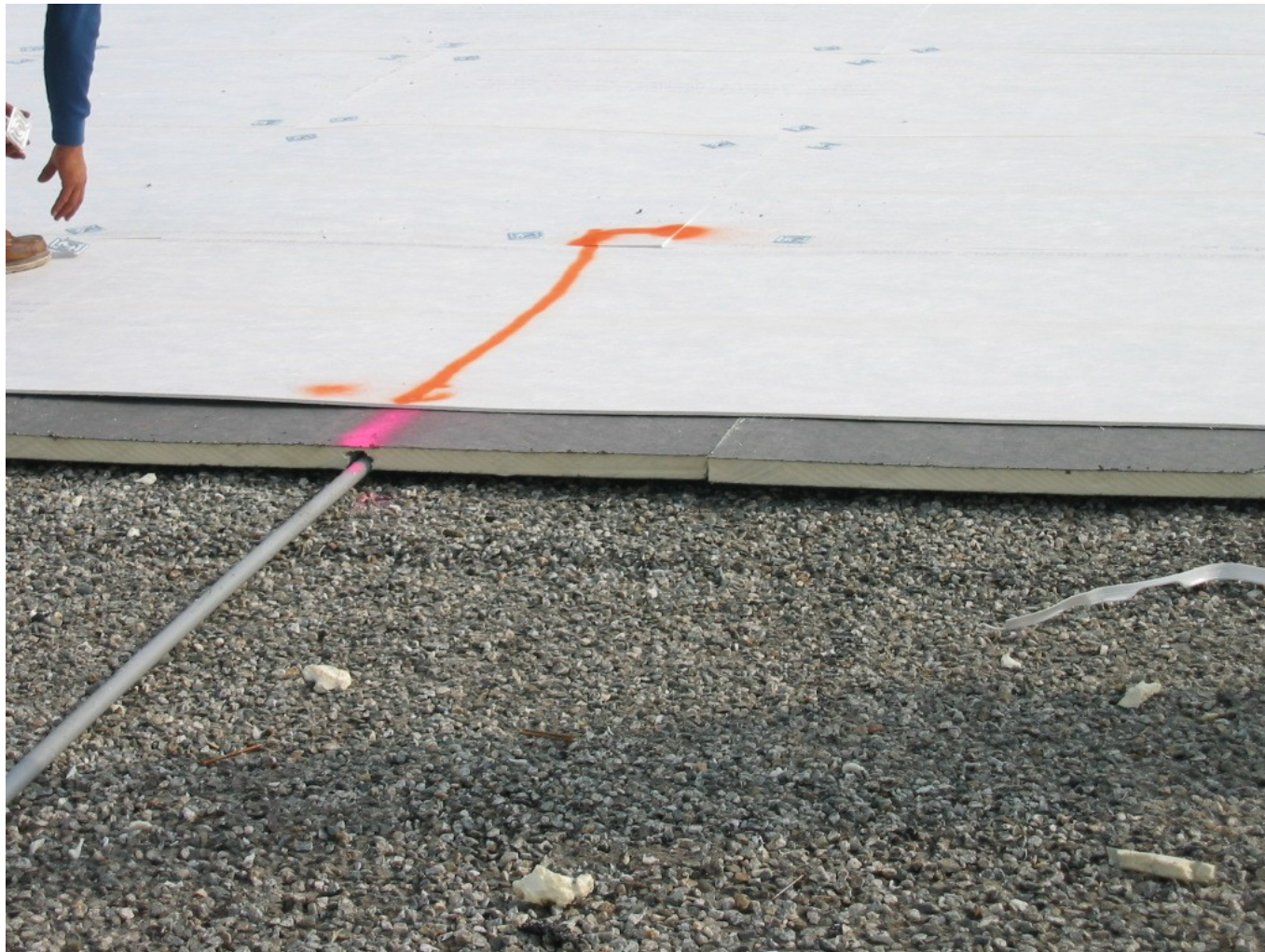


# BIPV Replacement Roofing Systems

- PV System Integrated with Replacement Roofing System
- Use MILCON Re-roofing Budget as Buy-Down for Project
- Acquire Generous State & Local PV Rebates
- Ideal Add-on Project for ESPC & UESC Contracting



**Electric conduit  
installed under 1 ½  
inches of insulations  
and ¼" DensDeck,  
which are  
mechanically attached  
to roof deck**





**DensDeck surface is marked to identify location of electrical conduit**



**All electrical conduit  
is passed through roof  
deck to utility room  
below for wiring**





**Multiple conduit lines  
are fed into combiner  
boxes**



**Final connections of  
all roof top electric  
wiring to Inverters  
and then to Utility  
Grid**

**Inverters convert DC  
power from Solar  
Panels to AC power.**











**Solar Array Modules  
are unrolled and  
arranged according to  
planned design**





**Solar Array Module  
is connected to  
electrical wiring  
from conduit under  
roofing assembly**







**Completed  
installation of Solar  
Array Modules**















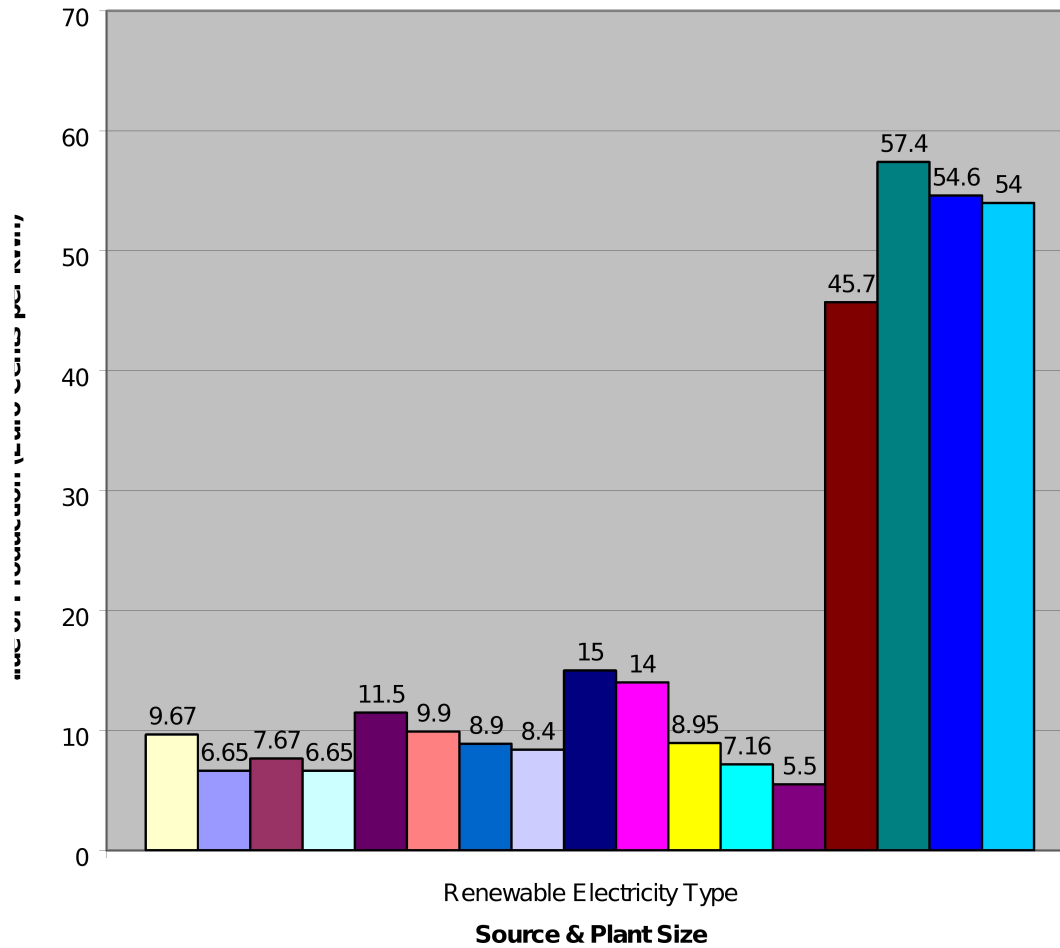
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